DOCUMENT RESUME

ED 155 274 UD 018 305

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TITLE Emergency School Aid Act (ESAA) Evaluation: Overview of Findings from Supplemental Analyses.

INSTITUTION System Development Corp., Santa Monica, Calif.

SPONS AGENCY Office of Education (DHEW), Washington, D.C.
PUB DATE Mar 78
CONTRACT OEC-0-73-0831; OEC-0-73-6336
NOTE 38p.; For related documents, see ED 117 229, ED 133 361-362, and UD 018 302 and 304-306

EDRS PRICE MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS *Academic Achievement; Achievement Gains; Achievement Rating; *Compensatory Education Programs; *Data Analysis; Disadvantaged Youth; *Mathematics; Program Effectiveness; *Program Evaluation; *Reading Achievement
IDENTIFIERS *Emergency School Aid Act

ABSTRACT

A major objective of this three year national Emergency School Aid Act (ESAA) study was to evaluate the impact of ESAA programs by comparing schools that received ESAA funds with those that did not. Student growth in reading and mathematics were compared. To identify what kinds of schools (what allocations of resources, and what types of instructional programs and practices) most increased students' achievement in reading and mathematics was a major objective of the evaluation. In addition, three supplemental tasks were performed as part of this evaluation. One of these was a restandardization of the California Achievement Tests to make the scores of low achieving students more interpretable. The second task was the development of percentile norms, using groups of ESAA students as the normative populations, to provide baseline data for assessing the performance of other disadvantaged groups. A third set of analyses arose from a more general concern with evaluating academic growth. Here growth estimates based on cross sectional data were compared with longitudinal estimates of academic growth. This paper presents the evaluation findings concerning the impact of ESAA including the relational analyses dealing with school success and the analyses of academic achievement of disadvantaged students. (Author/AM)

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ED155274

EMERGENCY SCHOOL AID ACT (ESAA) EVALUATION: OVERVIEW OF FINDINGS FROM SUPPLEMENTAL ANALYSES

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March 1978

The work reported here was performed as part of the Emergency School Aid Act National Evaluation United States Office of Education Contract Numbers OEC-0-73-0831 and OEC-0-73-6336

System Development Corporation

UD018305

TM-5236/027/00

NOTE

This report covers work performed during the ESAA Evaluation contract extension period, September 1977 through March 1978. During this period, John E. Coulson was the Project Director; Fred E. Cromer was Manager for Data Analysis; Ronald A. Carriere, William J. Doherty, Sally D. Hanes, and Anne H. MacQueen were the principal analysts; Eric Nelson-Lund was the project programmer; Suzie R. Navarrette was the data processing technician; Frank Tierney provided editorial support in report preparation; and Ethel Rothstein was project secretary. Clarence Bradford served as a consultant and participated in the data analyses.

We wish to thank Dr. David Shoemaker, Project Officer for the U.S. Office of Education, for his support, guidance, and cooperation in this study.

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I. INTRODUCTION

In conjunction with and under contracts from the U.S. Office of Education, System Development Corporation (SDC) conducted an evaluation of two closely related programs authorized under the Emergency School Aid Act (ESAA)--the Basic and Pilot Grants Programs. The evaluation of these programs involved the collection of data over a period of three school years: 1973-74, 1974-75, and 1975-76.

The ESAA evaluation had several objectives. In addition to describing the districts, schools, and students being supported under ESAA, and the educational services that ESAA funds provided, there were two major questions:

- What is the impact of ESAA in terms of congressionally authorized goals, both over a single year and over the three-year period?
- What kinds of school programs most successfully produce gains in student outcomes?

In meeting these study objectives, it became apparent that the ESAA data were an unusually rich source of information about disadvantaged students and the schools they attended, and that their potential had not been exhausted.* Consequently, additional work to further these objectives was undertaken by SDC during a contract extension period. The present report provides a summary overview of the results of these additional analyses.**

The general approach to the question concerning ESAA impact, both in the original analyses and in those reported here, was to compare schools that received ESAA funds with those that did not. The initial determination of ESAA funding took place when the schools were selected for study in 1973. Pairs of similar ESAA eligible schools in sample districts were identified, and one member of each

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*A complete list of relevant ESAA evaluation documentation is given at the end of this report.

**The supplemental analyses are discussed in greater detail in Carriere, et al., Supplemental Analyses of Data From the Emergency School Aid Act (ESAA) Evaluation Contract Extension Period, December 1977 through March 1978. System Development Corporation, TM-5236/025/00, March 1978.

pair was randomly assigned to receive ESAA funds and the other not to receive them. However, although a trend of increasing expenditure differences between treatment (ESAA-funded) and control (not ESAA-funded) schools over the three years was evident, the fundamental assumption of the treatment/control design--that per-pupil expenditures would be significantly greater in treatment schools--was met only among schools with Basic Grants Programs in the third year of the evaluation.*

An answer to the question concerning school success in producing gains in student outcomes was sought independently of the issue of ESAA funding. Data from ESAA-funded and from non-ESAA-funded schools were therefore combined. Two approaches were used in the original analyses and again in those reported here. One approach was to use all the schools participating in the ESAA evaluation. The second approach was to study subsets of these schools in greater depth. Two sets of in-depth study schools were specially selected for maximum contrast between success and nonsuccess, one set in the second year of the study (1974-75), and another in the third year (1975-76). These specially selected schools were the object of more intensive data collections--the schools being visited by SDC personnel who observed classroom activities and interviewed teachers and principals.

In addition to these two investigations, studies of the academic achievement of ESAA students were also undertaken during the contract extension period, yielding products that increased the interpretability and utility of ESAA test data. Two of these products focused particularly on disadvantaged students. One was a restandardization of the achievement tests used to assess program effectiveness, i.e., the California Achievement Tests; the other was the development of percentile norms for a standard reference group of ESAA-eligible students (typically low-achieving, low socioeconomic status) that provide baseline data

*Basic Grants were awarded to encourage the reduction of minority-group isolation, to meet the special needs incident to the elimination of segregation and discrimination, and to assist children in overcoming the educational disadvantagement associated with minority-group isolation. Pilot Grants were awarded for unusually promising projects designed to overcome the adverse effects of minority-group isolation by improving the academic achievement of children in minority-isolated schools.

which compensatory program administrators or researchers can use as a reference when working with similar groups of students. A third set of analyses arose from methodological issues concerning the relative merits of different procedures for evaluating academic growth. In these last analyses, growth estimates based on cross-sectional achievement data were compared with estimates based on true longitudinal data.

The results of these analyses are presented on the following pages, first those concerning the impact of ESAA, second the relational analyses dealing with school success, and last the analyses of academic achievement. Each of these topics is accompanied by a brief discussion of previous results, the particular issues that prompted further analyses, and how these analyses differ from the earlier ones.

II. PROGRAM IMPACT REANALYSES

A major objective of the three-year national ESAA study was to evaluate the impact of ESAA programs by comparing schools that received ESAA funds with those that did not. The comparison of primary interest was student growth in reading and mathematics, since a basic purpose of ESAA concerned the academic achievement of disadvantaged students.

The results reported earlier provided some evidence of ESAA program impact, particularly in the third year, in schools with Basic Grants Programs. However, evidence for an impact over the three-year period as a whole was weak. The additional analyses described here were undertaken to explore the issue of program impact further, and to determine whether previous conclusions would be confirmed or whether different results would point to new conclusions.

The impact reanalyses differed in two respects from the analyses conducted earlier. The chief difference was in the use of revised indices of achievement outcomes, and of alternate analysis models. These revisions were introduced out of a recognition that the methodological and technical details of constructing student achievement outcomes may affect findings. A second difference concerned the samples of schools and students that were studied. All impact reanalyses were confined to schools with Basic Grants Programs, since only among these schools were there significant funding differences between the treatment and control groups. These reanalyses also concerned academic growth over just two periods: the third year of ESAA, and the combined three-year period.

In the following paragraphs we describe first the achievement outcome measures that were used in the original analyses, and then the ways in which those measures and the analysis models were modified. Finally, the results of the reanalyses are presented and compared with previous results.

OUTCOME MEASURE IN THE ORIGINAL ESAA EVALUATION

As noted previously, the outcome of primary interest in the ESAA evaluation was student academic growth during each of three years (1973-74, 1974-75, and

1975-76), and over the entire three-year period for those students who remained in the sample all three years.

The first step in assessing academic growth was to administer the California Achievement Tests, in reading and mathematics, to all sample students in grades 3, 4, and 5 near the beginning and end of each academic year. Third-grade students took level-2 tests; 4th- and 5th-grade students took the more difficult level-3 tests. The test form (A or B) that a student received in the fall was determined by random assignment procedures; at the spring testing each student received the alternate form. Scale scores that 'equate' different levels and forms were then used to compute school average gains in each grade, separately for each subject area.* Gains were simply the differences between spring and fall scale scores. Thus, the outcome was the extent to which a school raised the average achievement of its ESAA students in reading or mathematics.

NEW OUTCOME MEASURES AND ANALYSIS MODELS

While many modifications of the outcome measures involve a technical presentation beyond the scope of this report, we will briefly summarize what was done, and why, so that the results of the reanalyses may be evaluated in context. We also have in mind the interests of program and school personnel who may perceive possibilities for improving how they might evaluate the academic growth of the students they serve. The modifications in the ESAA studies involved four aspects of the outcome measures: (1) how the tests were scored, (2) how change was measured, (3) the test content, and (4) the analysis unit.

How Tests Were Scored

The original third-year impact analyses used ESAA scale scores to measure student achievement. The reanalyses included two other types of scores: raw scores and latent trait ability scores.

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*Test publishers' scale scores were used for the first- and second-year analyses. Indications that these scale scores were not appropriate for use with a characteristically low-achieving student population led us to develop the ESAA scale scores for use in the third-year analyses (see Section IV, Analyses of Achievement, The Restandardization Study).

When students take achievement tests, the results are initially in the form of raw scores, which are simply the number of test items answered correctly. But because of variations among the forms and levels of a test, students may be expected to receive different raw scores depending on the form or level administered. Scale scores are raw scores that have been transformed by a special formula, enabling us to compare the performance of students taking different forms or levels of a test. However, these transformations may affect the apparent variability among students in such a way that treatment and control differences are masked. Consequently, achievement changes based on raw scores were used in some reanalyses.

Latent trait ability scores also transform raw scores and purport to equate different levels or forms of a test. In addition, however, each student's score is weighted according to (a) the difficulty of the items he answered correctly, (b) an estimate of the extent of his guessing, and (c) the extent to which items from the same domain were all answered correctly.* At this point, readers may be interested in knowing that the clearest set of relationships obtained in the overall evaluation relational reanalyses, which are described in Section III of this report, used latent trait ability scores as outcomes.

How Change was Measured

Change was measured in the original analyses by taking the difference between the spring (posttest) and fall (pretest) ESAA scale scores. While this is conceptually straightforward, technical difficulties exist which, under some conditions, may make this procedure an unsatisfactory method of analyzing change. An alternative method that may be more precise was therefore used in the reanalyses: posttest scores controlled for pretest. Raw scores, ESAA scale scores and latent trait ability scores were all adjusted in this manner.

Another modification of the change measure was intended to address a problem that arose inadvertently: there were some differences in the initial (pretest) achievement of the treatment and control groups for the 1975-76 school year,

*Additional material on latent trait ability scores is available in the Journal of Educational Measurement, Vol. 14, No. 2, Summer 1977.

despite the use of random assignment procedures. (Assignment to the treatment or control group preceded the first testing in the fall of 1973.) An analysis of program effects using a treatment/control design assumes the two groups to be initially equivalent with respect to critical variables, and when this assumption is violated, interpretation of any differences in achievement gains of the two groups is greatly complicated. In the original analyses, the problem was handled by adjusting gain scores for pretest scores. An attempt to improve the handling of the problem led during the contract extension period to the development and testing of other adjustments for initial differences between treatment and control groups.

The Test Content

Reading and mathematics gains were analyzed separately in the original analyses. An alternative was to analyze reading and mathematics in combination by using a multivariate analysis-of-variance technique (MANOVA). By reducing the number of analyses to be perf[illegible], this procedure lessened the likelihood of spurious results, i.e., of finding some apparently significant relationships by chance alone. The subscales making up the total scores were also analyzed in combination using MONOVA models.

In addition, an attempt was made to identify more discriminating subsets of test items to use as outcomes, since it was possible that the tests were poorly designed for low-achieving students. However, this effort was largely unsuccessful and no new outcomes of this type were used in the impact reanalyses.

The Analysis Unit

As indicated, the outcome of primary concern in the ESAA evaluation was the extent to which a school raised the average achievement of its ESAA students in reading, mathematics, or both. The school was selected as the unit of analysis because the sampling was conducted at that level. However, in order to explore the possibility of program impact in terms of differences among students, some of the reanalyses were conducted using the student as the unit of analysis.

REANALYSIS RESULTS

As noted earlier, the impact reanalyses were confined to the Basic elementary sample, since earlier work had shown that significant treatment/control differences in resource allocations occurred only in these schools. Cross-sectional reanalyses were conducted with the third-year data (1975-76) with 20 pairs of schools and 4787 students, and longitudinal reanalyses with data based on the 927 students who had remained in the study throughout the evaluation period. The alternative outcome measures were tested for treatment/control group differences, and their relationships with the newly developed program and exposure indices were studied (see Section III, Relational Reanalyses). However, no use of these latter indices as covariates or blocking variables in the impact reanalyses appeared warranted.

Results of the Cross-Sectional Reanalyses

Based on the modifications of outcomes and analysis models outlined above, a wide variety of program impact reanalyses were performed. The most notable fact concerning these reanalyses of the third-year ESAA data is that, with minor exceptions, they yielded results consistent with, and thus serving to confirm, the impact results reported in the earlier documents.

As noted in the earlier report, treatment schools in the Basic elementary sample had a statistically significant and educationally meaningful advantage over control schools in total per-pupil funding, in per-pupil supplemental allocations for reading and mathematics instruction, and in the use of remedial specialists and instructional aides in regular reading classes (Coulson, 1977). While differences in student outcomes--school average reading gain and school average mathematics gain--were not statistically significant for every grade, there was a clear pattern of larger gains in treatment schools.

The same pattern was evident in the reanalyses; academic growth for the third-year elementary sample was greater in treatment than in control schools, with statistically significant differences generally found in the 4th and 5th grades. Analyses using modified strategies to adjust for the initial differences between

treatment and control groups yielded results supporting earlier interpretations--that apparent differences in achievement growth were not due to latent growth differences between the two groups, and were, therefore, likely to be indicative of program impact. In some reanalyses, differences between treatment and control students were significant, where differences between schools were not.

Results of the Longitudinal Reanalyses

Evidence for the impact of ESAA programs over the three-year period was considerably stronger in some of the reanalyses than in the original analyses reported earlier. Based on the earlier analyses, we reported that "In general, there was no clear evidence of cumulative ESAA program impact over the three years" (Coulson, 1977), although some impact on reading achievement in the Basic elementary schools was apparent. In the longitudinal reanalyses, two kinds of evidence for positive treatment effects emerged. These were based on differences between treatment and control students, rather than differences between treatment and control schools.*

The first type of evidence came from an inspection of academic growth profiles. These profiles are simply the sequential plots of the six achievement scores obtained by students who participated in the study all three years, taking achievement tests in the fall and spring of the 3rd, 4th, and 5th grades. The reading growth profiles for treatment and control students may be compared by inspecting Figure 1.** Two comparisons can be made. One is to compare the gains of treatment and control students between consecutive test dates (steeper slopes indicate greater gains); the other is to compare the school-year periods with the between-school-year periods. It can be seen that average reading gains of the treatment students were always greater than those of control students during the school year and always less between school years.

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*Mean comparisons of treatment and control students are equivalent to those comparing treatment and control schools if each school score is weighted to reflect the number of students in the school.

**The math profiles were virtually the same as the reading profiles in terms of these comparisons, except that during one between-school-year period, gains in the two groups were the same.

The between-school-years comparisons suggest that the control group may have consisted of students with better retention, and perhaps better learning capabilities, than those in the treatment group. Since the treatment group students tended to catch up with the control group during the periods in which any ESAA program effects would probably be most manifest, i.e., during the school years, one logical inference is that ESAA experiences helped to offset any inherent superiority of the control group students, and to aid the treatment group students in maintaining or even improving their position relative to the control group. If one takes into account the five intervals being examined (three school years and two summer periods), and the two types of outcome measures (reading and mathematics), there are ten cases in which the pattern noted above (larger control-group gains between school years and larger treatment-group gains during the school years) could have occurred, or could have failed to occur. In actual fact, it occurred in all cases but one*--a result that would be expected by chance alone with a probability of less than one in a hundred. Thus, the pattern is strongly suggestive of a cumulative and positive impact of ESAA programs over the three evaluation years.

The second form of evidence of cumulative ESAA impact came from comparing total reading and total mathematics gains over the entire three-year period. Although the treatment/control differentials were modest compared to the total gains over the entire three years, the average gain of treatment students was significantly greater than that of control students.** If this same general trend were continued at the same rate over a student's entire school career, the cumulative effects of that student's participation in ESAA could be fairly substantial.

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*The exception consisted of one between-school-year period when mathematics gains in the two groups were the same.

**Differences between treatment and control groups were 12 ESAA scale score points in math and 14 in reading. Gains over the entire three-year period were approximately 200 points in mathematics and 150 in reading.

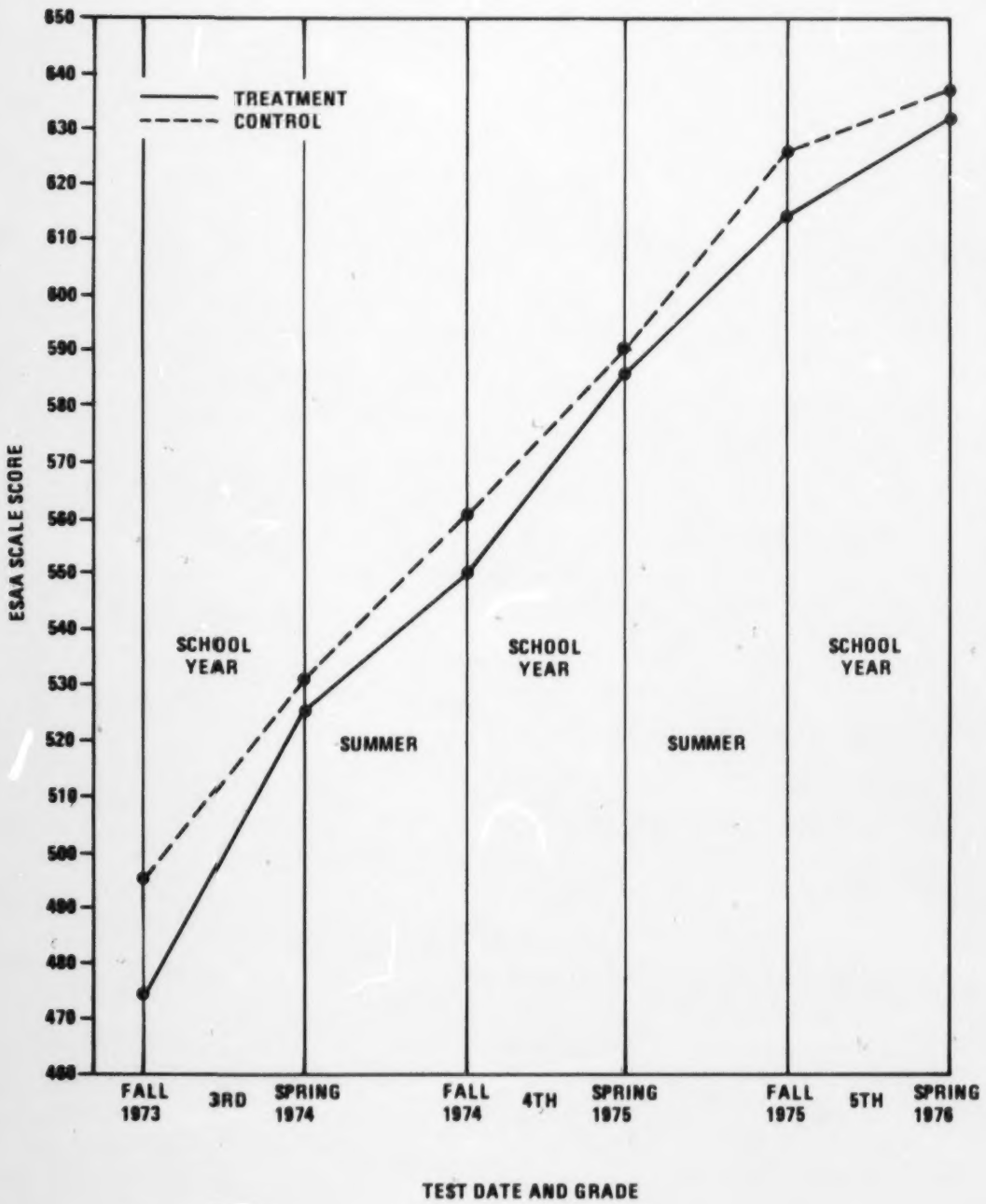


Figure 1. Reading Growth Profiles of Treatment and Control Students

III. RELATIONAL REANALYSES

The second major objective of the ESAA evaluation study was to identify what kinds of schools--what allocations of resources, and what types of instructional programs and practices--most increased students' achievement in reading and mathematics. Since funding sources were not an issue in this inquiry, data from ESAA-funded and from non-ESAA-funded schools were combined.

One way the question was approached was to analyze school factors in relation to school average gains, using data from the overall evaluation, that is, from all schools participating in the study. The original analyses of these data indicated that four categories of variables were most consistently related to achievement: per-pupil funding, time in instruction, pupil/teacher ratio, and activities supporting desegregation. However, these relationships were not necessarily found for every grade-level, for every subsample, or in every year of the study.

A second approach was to study in depth subsets of schools that were specially selected for maximum contrast between success and non-success in raising student achievement. Results from the two in-depth studies were most consistent in the areas of organizational climate and equality of educational opportunity (EEO). Strong administrative leadership in instruction and various indicators of EEO were related to school success in both studies. In the second in-depth study, the extent to which instructional programs were coordinated throughout the school was also found to be related to school success. Results in other areas (resource use, classroom instructional practices, and parent/community involvement) were somewhat less consistent.

The relational analyses undertaken during the contract extension period were directed towards confirming and/or further explicating these earlier findings. The results are described in the following paragraphs, first those connected with the overall evaluation and then those of the in-depth studies.

OVERALL EVALUATION

The reanalyses based on the overall evaluation were confined to the third-year data (1975-76) from the 40 elementary schools having Basic Grants Programs (see footnote, page 2). These analyses differed from earlier ones in their use of newly developed descriptor variables, as well as the new outcome measures described in the preceding section (II. Impact Reanalyses). The new descriptor variables were developed in an effort to simplify the general description of the ESAA study schools. To this end, single-item data were combined to produce composite indices, and these in turn were analyzed to determine if the schools could be sorted and classified in terms of a manageable number of descriptive profiles. These newly developed descriptions of the ESAA study schools are presented in the following paragraphs, followed by the results of the relational analyses using the new descriptor and outcome variables.

School Descriptions: Indices and Profiles

One or more indices to describe each of the following aspects of the 40 elementary schools with Basic Grants Programs were developed:

- students' attitudes, e.g., liking for school
- teachers' attitudes, e.g., satisfaction with assigned school
- exposure to instruction, e.g., number of hours in reading
- exposure to integration: this was a single index combining attitudes, activities, and exposure
- the school's authority structure, i.e., participation in decision-making by district personnel, the principal, the teachers, and the parents
- the school's program emphasis, i.e., the allocation of time, funds, and/or personnel to different program areas such as reading, mathematics, counseling, and cultural heritage/intergroup relations
- the school's class assignment and grouping practices, e.g., class size, extent of small-group or individualized instruction, the basis on which students are assigned to classes or groups
- the educational/economic disadvantagement of the student body

By examining how schools clustered in terms of about 20 of these indices, six fairly distinctive groups were identified. Each group was characterized by a pattern of descriptors that constituted the group profile. The following six profiles were identified.

1. One group of five schools was distinguished by a multi-directed authority structure, with administrators, teachers, and parents all highly involved in school and classroom decisions. No clearcut program emphasis was evident, and though class assignment was based on students' needs or ability to some extent, it was generally accomplished by an arbitrary means, such as alphabetically.

2. A group of nine schools was characterized by strong district direction, with an emphasis on reading and mathematics in large classes, and curriculum, materials, and methods geared to individualized instruction.

3. In seven schools, direction by the principal was typical. Reading and mathematics were emphasized, but in conventional classrooms where instruction was not individualized. There was little use of support personnel and various other resources, especially for mathematics.

4. As with the above two groups, another four schools also emphasized reading and mathematics, but by instructing students in small groups with greater use of support personnel. A relatively large number of disadvantaged students attended these schools.

5. Another seven schools were distinguished by the emphasis on counseling and on cultural heritage/intergroup relations programs. Students were assigned to relatively small classes on the basis of special need or ability. Few disadvantaged students attended these schools.

6. Eight schools were distinguished by the low level of district participation in decisions. These schools also emphasized cultural heritage/intergroup relations programs but, in contrast to the last group, did not emphasize counseling or assign students to classes on the basis of their special needs.

Results of New Analyses

The new relational analyses yielded results that were generally consistent with previous ones, but provided stronger evidence that students who had longer periods of exposure also tended to have larger achievement gains; this was particularly clear in mathematics. As in earlier analyses, it was found that achievement at the end of the year could best be predicted by performance at the beginning of the year, but exposure to instruction also made a difference. That is, there was a small but statistically significant association between exposure to mathematics instruction during the year, and mathematics performance at the end of the year, independent of the performance at the beginning of the year.

The reanalyses also showed that students' attitudes were related to achievement. While attitudes may be more difficult for schools to alter than amount of instructional time, this finding provides some support for efforts to promote the students' sense of control and mastery, to increase their liking for school, and to enhance their feelings of belonging.

IN-DEPTH STUDIES

Reanalyses of data from the 25 schools* studied in depth in 1975-76 focused on two areas in which previous findings had been the most difficult to interpret: resource-use and the classroom instruction. The approach in these reanalyses was to consider how the earlier findings concerning school organization might be related both to school success and to the areas of interest: resource use and classroom activities. Other reanalyses that used data from both in-depth studies (1974-75 and 1975-76) sought to determine how the results of relational analyses involving student achievement and teacher satisfaction might differ depending on how school success was defined.

The reanalyses of resource-use identified a school organizational variable--the extent to which instructional programs were coordinated throughout the school--as a factor that conditioned the relationship between resource-use and school

*While 26 schools were chosen for in-depth study in 1975-76, one was dropped from further study in the school-level analyses since data on only one class were available.

success. In schools with highly coordinated programs, there was greater chance of success in schools where the principal devoted larger amounts of time to planning instructional programs, to developing curriculum, and to his own in-service training. In schools with programs that were less coordinated, there was some indication that success was associated with greater use of three classroom resources: equipment, instructional aides, and the time teachers spent in instructing reading and mathematics. Examples of these relationships are shown in Figures 2 and 3, in which time has been translated into dollar costs. As Figure 2 indicates, the difference between the average costs of the principal's time for program planning in successful versus nonsuccessful schools is significant only among schools with highly coordinated programs ($\alpha \leq .05$, two-tailed t-test). Figure 3 shows the average costs of teachers' instructional time; the difference between successful and nonsuccessful groups is significant only among schools with less coordinated programs ($\alpha \leq .05$, two-tailed Mann Whitney U test).*

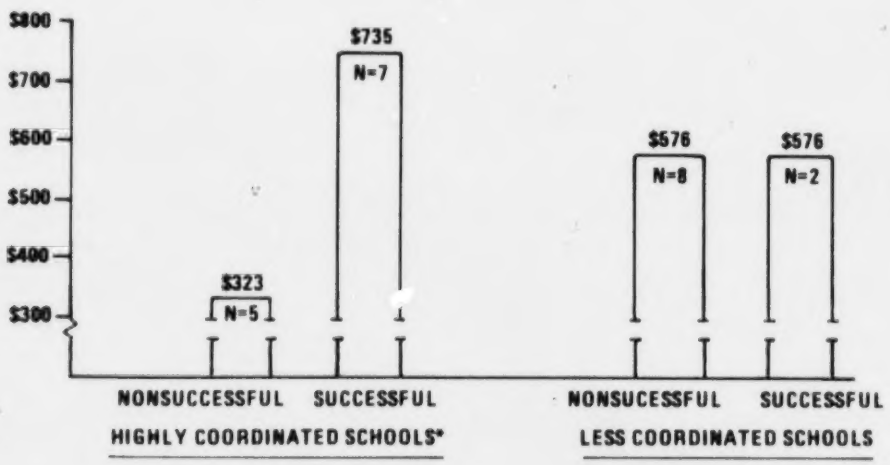
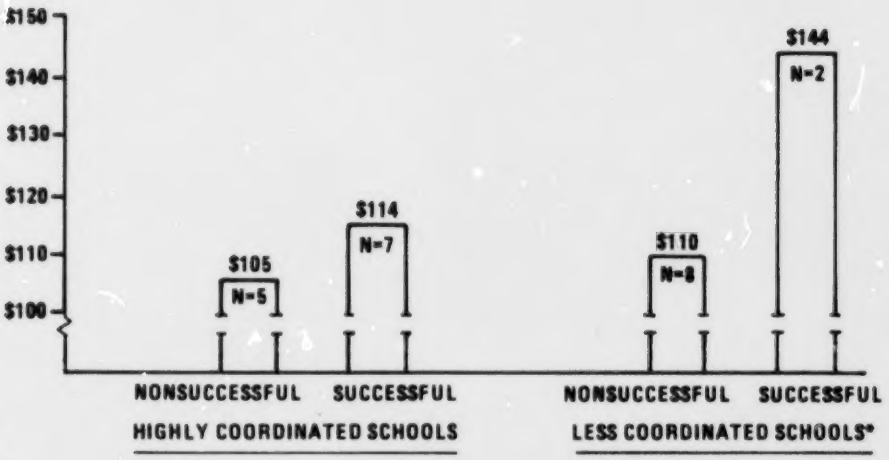


Figure 2. Average Costs of the Principal's Time in Program Planning

*Because the sample was small and skewed, the Mann Whitney U test was used to assess the significance of the differences between the successful and nonsuccessful groups where program coordination was low.



*THE DIFFERENCE BETWEEN SUCCESSFUL AND NONSUCCESSFUL WAS SIGNIFICANT AT .05, TWO-TAILED MANN WHITNEY U TEST.

Figure 3. Average Per-Pupil Cost of Teachers' Time in Reading and Math Instruction

The relationship of teacher inservice training to school success was reanalyzed by examining it separately in each of two groups of schools, one group in which the coordination level was high and the other in which it was low. As Figure 4 shows, a tendency for greater success to be associated with lower amounts of inservice training is evident when the two groups of schools are examined separately, but not when the groups are combined. (In this figure, time spent in inservice training has been translated into average per-teacher costs.) The figure also shows that teachers in schools with highly coordinated programs spent significantly less time in inservice training than those in schools with less coordinated programs--in terms of dollars, an average of $5.52 compared to $7.53. A related finding was that training in highly coordinated schools was provided primarily by on-site personnel--the principal, and other teachers--whereas in less coordinated schools it was provided by district employees, consultants, and other outside experts.

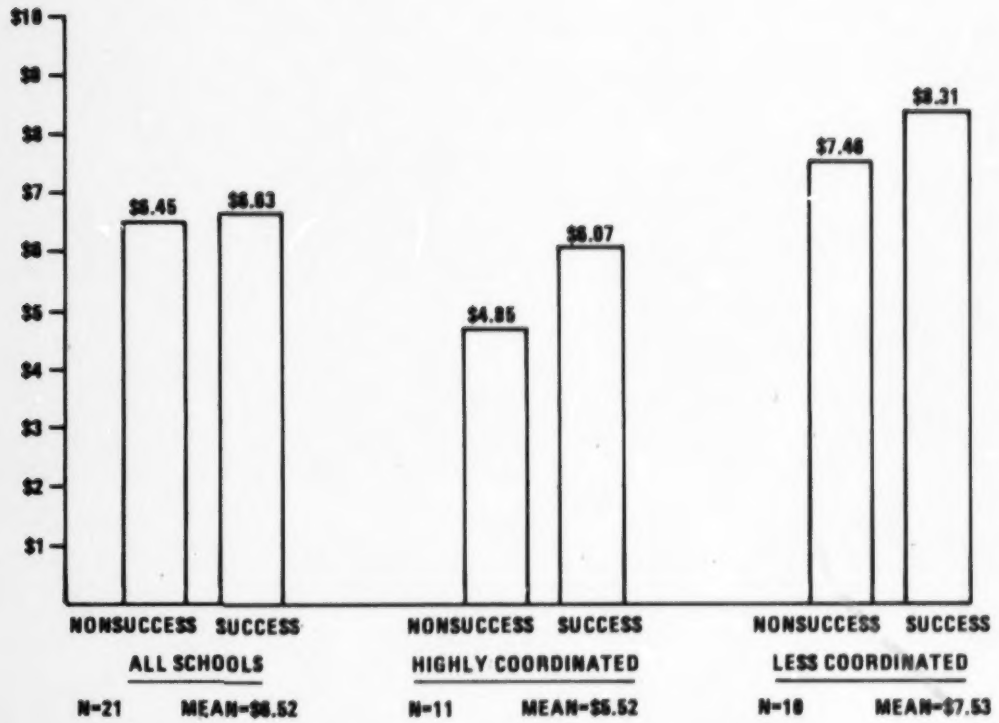


Figure 4. Average Cost Per Teacher for Inservice Training, for Different Subgroups of Schools

In other analyses, classroom characteristics and activities were re-examined in an attempt to connect them to school factors on the one hand, and to student mathematics achievement gains on the other.* That is, it was thought that certain classroom characteristics might occur more frequently in certain types of schools, and that those classroom characteristics might facilitate or impede student learning. One such classroom factor was the orderliness of students as they progressed from one task to another in their classwork. Specifically, there tended to be more orderly student progressions in highly coordinated schools, and students in those schools tended to make larger achievement gains.

*Because our earlier analyses of classrooms had been more successful in identifying instructional practices related to gains in mathematics than in reading, the analyses reported here (on classroom factors) were confined to mathematics.

Additional analyses were performed to explore further the relationships between school coordination level and classroom orderliness; these analyses sought to identify classroom teaching practices that might be influenced by school coordination, and that might, in turn, influence orderliness in student progress from task to task. Five such teaching practices--three related to classroom management and two to instructional techniques--were identified. The classroom factors associated with higher school coordination levels and with more orderly student progress were (1) greater task orientation on the teacher's part, (2) more intensive teacher monitoring of student progress, (3) less frequent use by teachers of yelling or other verbal abuse, (4) greater use of learning objectives in the daily instruction, and (5) greater individualization of the instruction.

One other classroom factor was related to mathematics achievement gains, but only for minority students. Minority students whose teachers believed that race and family income were not important determinants of academic success showed greater gains than minority students whose teachers felt these student background factors did affect academic performance. White students' gains were unrelated to their teachers' attitudes on this subject. Though the direction of causality is not entirely clear, one possible interpretation of this finding is that teachers who take greater responsibility on themselves for the success or failure of their students are more effective than those who use student race or other personal characteristics as a scapegoat for their own failures to teach the students.

A final set of reanalyses used data from both in-depth studies to examine how relational results might depend on the choice of the achievement outcome used to define school success. The outcome used in the original analyses of both in-depth studies was based on study-year gains. Most other such studies reported in the literature have used prior-year gains as the outcome; that is, they defined a school as successful or unsuccessful on the basis of achievement data collected the year before the data on school program characteristics were collected. The design of our in-depth studies made it feasible to compare results using the two different methods of defining school success, and also to examine more critically the possible direction of causal relationships between two variables that had been found correlated: student achievement level and job satisfaction on the part of teachers. One tentative conclusion from these

reanalyses was that greater teacher satisfaction was probably more a result than a cause of greater student success; this inference is based in part on the finding that teacher satisfaction was more strongly related to prior student achievement level than to the gains made by students during the year in which teacher satisfaction was measured. The second conclusion was that school success is somewhat variable from year to year, and that attempts to infer causal relationships by correlating one year's school program data with the previous year's achievement data can be misleading.

IV. ANALYSES OF ACHIEVEMENT

Three supplemental tasks were completed during the contract extension period that were intended to enhance the utility and interpretability of the ESAA evaluation achievement data. Two were specifically relevant to evaluating the academic achievement of disadvantaged students. One of these, a restandardization of the California Achievement Tests to make the scores of low-achieving students more interpretable, was completed earlier but documented more fully during the extension period. The second such task was the development of percentile norms, using groups of ESAA students as the normative populations, to provide baseline data for assessing the performance of other disadvantaged groups. A third set of analyses arose from a more general concern with evaluating academic growth; in these latter analyses, growth estimates based on cross-sectional data were compared with 'true' longitudinal estimates of academic growth.

RESTANDARDIZATION STUDY

The restandardization study was concerned with how the achievement tests were scored. When a student takes these tests, the results are initially in the form of raw scores, which are simply the numbers of test items answered correctly. However, it is often necessary to transform raw scores to scale scores, as it was in the ESAA evaluation, in order to permit comparisons among individual students who have taken different forms or levels of a test. The publisher's scale scores for the California Achievement Tests (which were the tests used at the elementary level in the ESAA evaluation) were developed for use with nationally representative samples of students, where performance varies over a wide range of values. Based on the evidence from the first and second years of the evaluation, it appeared that these scale scores were not totally appropriate for use with low-achieving students such as those comprising most of the ESAA sample. It was found that alternate forms at a given level of the test were not completely equated with respect to their difficulty, and that there were discontinuities in the achievement growth curves where the students advanced from one test level to the next. Such findings are by no means an exclusive characteristic of the California Achievement Tests; similar problems have been reported by other researchers in most of the commonly used test batteries, when

those batteries are administered to disadvantaged students similar to the ESAA sample. Nevertheless, it was felt that the results of the ESAA evaluation would be more meaningful if the students' raw scores could be converted to a new scale that would eliminate or at least ameliorate the problems encountered with the California Achievement Test scales. ESAA Scale Scores were thus developed, and were found to improve considerably the comparability across different forms and levels of the test. An adequate description of that restandardization process and its products would be beyond the scope of this overview, but a thorough discussion can be found in the more detailed report for the contract extension.*

From the standpoint of individuals providing or evaluating educational programs for disadvantaged children, the important conclusion to be derived from SDC's restandardization effort is that any attempt to assess students' achievement growth or program impact on that growth may be impeded by the technical problems inherent in the publisher's normative scales. Those problems stem, at least in large measure, from the attempt to apply norms developed for a nationally representative sample, i.e., for average cross-section students, to a group that is concentrated at one end of the national distribution. An alternative scaling system such as that developed in this study, where norms are developed for the particular subpopulation of concern, can yield more interpretable and useful results.

DISTRIBUTION OF ACHIEVEMENT SCORES IN A DISADVANTAGED POPULATION

As noted in the preceding section of this overview, normative data for achievement tests are usually based on nationally representative samples of students. Such norms are quite useful in assessing the performance of 'average' students, but may lead to unrealistic goals or expectations if applied to students in the lower deciles of the national distribution, i.e., disadvantaged students. Suppose, for example, that the director of a local compensatory education project wishes to evaluate how well the project is succeeding. If he bases his evaluation on the students' achievement test scores and compares these scores against

*Carriere et al., Supplemental Analyses of Data From the Emergency School Aid Act (ESAA) Evaluation: Findings of the Contract Extension Period, December Through March 1978. System Development Corporation, TM-5236/025/00, March 1978.

the publisher's national norms, he will find they are quite low, but he may believe they are not as low as they might have been without the compensatory education project. To determine whether this is true (and assuming that it is not practical for him to use a control group), he would need benchmark or comparison data from some other group of students similar to his own group in achievement, socioeconomic status, racial composition, etc. The purpose of the effort discussed here was to prepare a handbook that would provide such benchmark data. That handbook, which is described below in very general terms, is one of the products of the contract extension period.*

Briefly, the handbook consists of a series of tables showing the distribution of achievement test scores for the ESAA sample students. There are separate tables for each of six grade levels (grades 3 through 5, and 10 through 12), for reading, mathematics, and total scores. In addition, the data are shown for individual test administrations (cross-sectional data) and across successive administrations (longitudinal data). Every score is represented in three forms: raw score, publisher's scale score, and ESAA Scale Score. In addition, conversions are provided so that scores can be referenced to other tests that were used in the ETS Anchor Study.**

With these tables and their accompanying explanation, interested users can answer questions such as:

- How do the achievement gains of students in a given program compare with the achievement level of the ESAA sample (which might be considered representative in background characteristics of students participating in a given compensatory education program?
- How do the achievement gains of students in a given program for the disadvantaged compare with the gains of the ESAA sample students over comparable periods of time?

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*Cromer, F. E. The Distribution of Achievement Scores in a Disadvantaged Population: Cross-Sectional and Longitudinal Comparisons with a Standard Population. System Development Corporation, TM-5236/026/00, March 1978

**Loret, Peter G. et al. Anchor Test Study: Equivalence and Norm Tables for Selected Reading Achievement Tests (Grades 4, 5, 6), U.S. Government Printing Office, Washington, D.C., 1974.

COMPARISONS OF ACHIEVEMENT GROWTH ESTIMATES USING LONGITUDINAL VERSUS CROSS-SECTIONAL DATA

In the ESAA evaluation, achievement test data were collected two times in each of three school years, and there was a subset of students who were in the study for the entire three years. This made it possible to track the test performance of that subset (the 'longitudinal sample') and to examine trends in the students' basic skills over the six successive data points. But such longitudinal studies are the exception rather than the rule in educational research, in part because of the extra costs involved in giving repeated measures over several years. A more common approach in the past has been to collect data at a single point in time from groups of students at different grade levels, and to assume that the difference in the groups' average scores from one grade to another is equivalent to the gain that would have been made by a single group of students in the time interval between the two grades. In effect, this latter approach (sometimes called 'psuedo-longitudinal' design) uses cross-sectional data to simulate the data from a 'true' longitudinal design.

Because the ESAA study design included both cross-sectional data from three successive grade levels, and longitudinal data spanning the three-year period, it provided an opportunity to compare the students' growth trends calculated from the two types of data. It was felt that the results would be informative with respect to the interpretation of studies using a pseudo-longitudinal approach, particularly concerning the validity of the assumption that the two methods are functionally equivalent.

Actually, the ESAA data were amenable to the comparison of three methods of estimating growth, each representing an alternative design for collecting data. In the matched longitudinal design, the performance of the same individuals at different points in time was compared. This is usually referred to as a 'true' longitudinal design. A second method used an unmatched longitudinal design. In this design, all students who were present at each test were included in the comparison, regardless of whether they were present at the other test. This second method assumes that while individuals taking the two tests may have differed somewhat, as a group they were equivalent. In the third method of approxi-

mating growth, sampling was cross-sectional; i.e., performance data were collected on students in different grades at a single point in time, and growth was estimated by comparing the performance of students in one grade with that of students in another grade.

The results of these comparisons of achievement growth patterns indicated noticeable differences between the unmatched longitudinal design and the other two designs. Specifically, growth estimates were greater when obtained from the unmatched design. This difference may be explained by the fact that the assumption on which an unmatched design is based was not met, i.e., the groups of students from successive years were not equivalent. By comparing the three sets of cross-sectional data, it was found that students who entered ESAA programs after the first year were more able than students who joined earlier. Had they been less able, we could have expected growth estimates based on the unmatched design to be smaller than estimates based on the other designs. Had the ability of new students not differed from the ability of the initial participants, we might have expected no difference in these estimates.

No appreciable differences were found between the results of the cross-sectional and matched longitudinal designs. However, this latter finding should not be generalized too strongly, that is, it should not be concluded that cross-sectional data will always yield the same results as longitudinal data. For example, any growth patterns projected from cross-sectional data collected at the beginning of a longitudinal period will clearly fail to match the actual longitudinal growth patterns if environmental changes influencing student achievement occur during the longitudinal period of concern. This is because the cross-sectional patterns reflect only the conditions existing up to the cross-sectional data-collection point; as simulations of trends over time, they represent extrapolations of the past into the future. Thus, if desegregation occurred during a certain period and affected growth, projections from cross-sectional data collected at the start of that period might well fail to show the same growth patterns that would be obtained from the longitudinal data for that period.

V. SUMMARY OF FINDINGS AND COMPARISONS WITH OTHER STUDY RESULTS

IMPACT REANALYSIS RESULTS

The earlier analyses from the three years of the ESAA evaluation showed that ESAA funds were being granted to needy schools and students, and that these funds were being used to provide needed services. There was also evidence that participation in ESAA helped to increase student achievement in the basic skills. While differences between the schools that received ESAA funds and those that did not were hardly detectable in the first year (1973-74), the differences increased in each succeeding year. In the third year (1975-76), the evidence for program impact was clear-cut within the Basic elementary sample, as there were statistically significant treatment-control differences in achievement gains for that sample favoring the ESAA-funded schools. Meaningful impact analyses were not possible for the other two samples, Basic secondary and Pilot elementary, because there was no evidence for these samples of significant differences in services provided to students in the treatment and control schools.

The finding of ESAA program impact for the third-year Basic elementary sample was further substantiated by the results of the reanalyses. These reanalyses utilized several different techniques for quantifying the achievement gains of the treatment and control schools, and for adjusting those gains for the differences that existed between the two groups' test scores at the beginning of the year. The results of the reanalyses were generally consistent with findings reported earlier for the original analyses, and thus strongly suggest that those findings reflected actual program impact rather than any statistical artifacts.

In the case of the longitudinal (three-year) data, reanalyses showed much stronger evidence of cumulative program impact for the Basic elementary sample than was found in the original analyses. For example, when analyses were performed at the student level (rather than at the school level as in the earlier analyses), and when treatment and control students' gains during school years were compared with gains between school years, it appeared that control students may have had higher inherent learning abilities than treatment students, since control students gained consistently more over the summer periods; however, treatment stu-

dents made consistently larger gains within the school years. These trends were statistically significant, and provide some evidence that ESAA program efforts helped the treatment students to recover some of their lost ground, relative to the control students, during each school year.

Additional evidence of cumulative program impact came from other student-level analyses showing that the average gain of treatment students over the entire three years was significantly greater than that of control students. Those differences were fairly small in absolute magnitude, but could add up very substantially if similar gains continued over a student's entire school career.

These results suggest that the success of compensatory education may depend on efforts that are sustained over several years. Short-term impact, especially in the initial stages of a program, appeared to be slight in the case of ESAA; but over a longer period differences in the achievement gains between students who received compensatory services and those who did not become apparent.

RELATIONAL REANALYSIS RESULTS

In addition to assessing the impact of the ESAA programs, another objective of the ESAA study was to evaluate the relative effectiveness of different school program approaches, regardless of whether ESAA or some other source supplied the supporting funds. Focusing on areas with potential implications for program decisions, the factors that the original analyses found most consistently related to school success in raising student achievement were (a) stronger administrative leadership in instruction, (b) greater time spent in instruction, (c) more structured teaching, (d) efforts to promote equality of educational opportunity, and (3) greater resource availability and utilization.

The results of the reanalyses were consistent with these earlier ones, but provided stronger evidence that students who spent more time in instruction made larger achievement gains. Several previous studies have also reported positive relationships between exposure time and achievement (Kidder, 1974; O'Reilly, 1974; Wiley and Harnischfeger, 1974; California Effectiveness Study, 1977). It is fair to note, however, that a study of reading in several Los Angeles schools failed to show beneficial effects of increased exposure (Armor et al., 1976).

Though new in some respects, the findings of the reanalyses concerning school organization, resource-use and classroom activities were also consistent with earlier ESAA study results. The organizational factor shown by the reanalyses to be particularly important was the extent to which instructional programs were coordinated throughout the school. Schoolwide coordination was reported by the second in-depth study (1975-76) to be related to the various components of administrative leadership (particularly the communication of administrative views by regular review and discussion of teaching performance), as well as to school success. In the reanalyses, coordination emerged as an important factor in mediating relationships between student achievement and resource-use, and similarly, between achievement and classroom factors.

The reanalyses of resource-use in the in-depth schools revealed that in schools where instructional programs were highly coordinated school success in raising student achievement was related to a set of resources associated with the principal; specifically, greater success was found where the principal spent more time in planning instructional programs, in developing curricula, and in receiving inservice training in instruction-related tasks. In schools where programs were less coordinated, there was tentative evidence that school success was enhanced where greater resources were used in the classroom, e.g., where there was greater use of equipment, of instructional aides, and of teachers' time. When the relationship of teacher inservice training to school success was examined separately at the two coordination levels (high and low), a tendency was found for more inservice training to be associated with greater student achievement.

Other recent research has also found a positive relationship between degree of program coordination and student achievement (Michigan State Department of Education, 1976; Armor et al., 1976). With respect to resources, both the earlier ESAA analyses and other studies have found that, in general, more resources are associated with greater achievement, but that no one specific school resource is consistently related to student outcomes. As pointed out by a major reviewer, "Some school resources appear to be important in each study, but the same resources appear to be unimportant in other studies." (Averch et al., 1972,

p. 48). Such inconsistency suggests that the effectiveness of a particular resource is dependent on the context or circumstance of its use, and the results of the ESAA reanalyses of resource-use seem to support this hypothesis. The reanalyses of classroom characteristics and activities also pointed to the importance of schoolwide coordination of instructional programs. One classroom factor that was related to achievement, the orderliness of students as they progressed from one task to another in their classwork, was also related to program coordination. That is, in schools with more highly coordinated instructional programs, classrooms tended to be characterized by student activity that showed better articulation of tasks, and such task articulation was apparently beneficial to student achievement. In addition, the reanalysis identified three classroom management practices and two instructional techniques that were related both to classroom orderliness, on the one hand, and to schoolwide program coordination on the other. The management practices used by teachers in the more orderly classrooms included greater task-orientation on their own part, more frequent monitoring of students' work, and greater restraint from yelling and other verbal abuse. Instructional techniques found to a greater degree in more orderly classrooms and highly coordinated schools were use of learning objectives (specifically defined goals) and individualized mode of instruction.

These findings appear consistent with earlier ESAA study results concerning the effectiveness of structured teaching, and with those of several other studies involving disadvantaged students. A recent review, summarizing and synthesizing the results of a number of earlier studies, concluded that "The tightly structured program approach, including frequent and immediate feedback to the student, combined with a tutorial relationship, individual pacing, and somewhat individualized programming are positively associated with accelerated pupil achievement." (Gordon, 1971, p. 24). Other studies with similar findings include ones by Furst and Amidon (1967), Penny (1969) and Soar (1966).

Finally, one of the most interesting and potentially important findings of the reanalyses was that minority students of teachers who regarded the students' race and family income as important determiners of student achievement tended to make smaller achievement gains than did the minority students of teachers

who discounted the importance of such background characteristics. The study's design did not provide a basis for any conclusions about causality, that is, we cannot state with any confidence that differences in minority student achievement resulted from differences in the teachers' attitudes. Nevertheless, it seems quite possible that a stated belief in the importance of racial and economic factors in determining achievement may represent a defeatist attitude on the teachers' part--a tendency to 'give up' on the minority students, and to accept poor performance from those students rather than insisting that they exert themselves to meet academic standards. Such an inference is completely consistent with the finding, reported earlier from the ESAA in-depth studies, that schools whose teachers praise students uncritically, i.e., without regard for their actual achievement, tend to be less successful in improving achievement.* From this combination of evidence, there appears to be a reasonable basis for speculating that the quality of instruction for minority students might be significantly enhanced by strongly emphasizing in the teachers' preservice and inservice training that minority students can and should be expected to meet academic standards, and that the teachers have a responsibility for seeing that they do meet those standards.

*Wellisch et al., An In-Depth Study of Emergency School Aid Act (ESAA) Schools: 1974-75, System Development Corporation, Santa Monica, 1976.

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